



CHAPTER 2

Health Determinants, Measurements, and Trends

LEARNING OBJECTIVES

By the end of this chapter the reader will be able to:

- Describe the determinants of health
- Define the most important health indicators
- Discuss the differences between incidence and prevalence; morbidity, disability, and mortality; and non-communicable and communicable diseases
- Discuss the concepts of Health Adjusted Life Expectancy (HALE), Disability Adjusted Life Years (DALYs), and the burden of disease
- Describe the leading causes of death in low-, middle-, and high-income countries
- Describe the demographic and epidemiological transitions

VIGNETTES

Shawki is a 60-year-old Jordanian man who lives in Jordan's capital of Amman. Unfortunately, Shawki's health has deteriorated in the last year. His blood pressure and cholesterol are too high. He has developed diabetes. He is sometimes short of breath. What are the causes of his ill and declining health? Do these problems stem from any genetic issues? Could they come from a lack of understanding about a healthy lifestyle and diet? Could it be that Shawki lacks the income he needs to eat properly and to ensure that he gets health checkups when he needs them?

Life expectancy in Botswana prior to the spread of HIV/AIDS was about 65 years.¹ Today, it is about 40 years.¹ Life expectancy in Russia in 1985 was about 64 years for males and 74 years for females. In 2001, however, it had fallen to about 59 years for males and 72 years for females.² What does

life expectancy measure? What are the factors contributing to its decline in both of these countries? What has happened to trends in life expectancy in other countries? Which countries have the longest and shortest life expectancies and why?

In Cambodia today, families have, on average, four children and those children, on average, will live about 57 years.³ Many children will die in their first month of life, and the leading causes of infant and child death will be diarrhea and pneumonia. Thirty years ago, the demographic and epidemiological profile of Thailand looked a lot like Cambodia looks today.⁴ Today, however, Thai families have on average about two children and those children on average will live 71 years.⁵ Children in Thailand rarely die, and when they do, 50 percent of them die from injury.⁶ What causes these shifts in fertility and mortality? Do they occur consistently as countries develop economically? How long will it take before Cambodia has the same fertility and disease burden that Thailand has today?

In Peru, the people who are poor tend to live in the mountains, be indigenous people, be less educated, and have worse health status than other people. In Eastern Europe, the same issues occur among their ethnic groups that are of lower socioeconomic status, such as the Roma people. In the United States, there are also enormous health disparities, as seen in the relative health status of African Americans and Native Americans. If one wants to understand and address differences in health status among different groups, then how do we have to measure health status? Do we measure it by age? By gender? By socioeconomic status? By level of education? By ethnicity? By location?

THE IMPORTANCE OF MEASURING HEALTH STATUS

If we want to understand the most important global health issues and what can be done to address them, then we must understand what factors have the most influence on health status, how health status is measured, and what key trends in health status have occurred historically. We must, in fact, be able to answer the questions that are posed in the narratives above.

This chapter, therefore, covers four distinct, but closely related topics. The first section concerns what are called "the determinants of health." That section examines the most important factors that relate to people's health status. The second section reviews some of the most important indicators of health status and how they are used. The third section discusses the burden of disease worldwide and how it varies across countries. The last section looks at how fertility and mortality change as countries become more developed and what this means for the types of health problems countries face.

THE DETERMINANTS OF HEALTH

Why are some people healthy and some people not healthy? When asked this question, many of us will respond that good health depends on access to health services. Yet, as you will learn, whether or not people are healthy depends on a large number of factors, many of which are interconnected, and most of which go considerably beyond access to health services.

There has been considerable writing about the "determinants of health" and one way of depicting these determinants is shown in Figure 2-1. The next section largely follows the approach to the determinants of health that is discussed in "What Determines Health" by the Public Health Agency of Canada.⁵

The first group of factors that helps to determine health relates to the personal and inborn features of individuals. These include genetic makeup, sex, and age. Our genetic makeup has much to do with what diseases we get and how healthy we live. One can inherit, for example, a genetic marker for a particular disease, such as Huntington's disease, which is a neurological disorder. One can also inherit the genetic component of a disease that has multiple causes, such as breast cancer. Sex also has an important relationship with health. Men and women are physically different, for example, and may get different diseases. Women face the risk of childbearing. They also get cervical and uterine cancers that men do not get. Women also have higher rates of certain health conditions, such as thyroid and breast cancers. For similar reasons, age is also an important determinant of

health. Young children in developing countries often die of diarrheal disease, while older people are much more likely to die of heart disease, to cite one of many examples of the relationship between health and age.

Social and cultural issues also play important roles in determining health. Social status is an important health determinant. There is good evidence that people of higher social status have more control over their lives than people of lower status, and people of higher social status also tend to have higher incomes and education, both of which are strongly correlated with better health.⁶ In addition, the gender roles that are ascribed to women in many societies also have an important impact on health. In such environments, women may be less well treated than men and this, in turn, may mean that women have less income, less education, and fewer opportunities to engage in safe employment. All of these militate against their good health.

The extent to which people get social support from family, friends, and community has also been shown to have an important link with health.⁷ The stronger the social networks and the stronger the support that people get from those networks, the healthier people will be. Of course, culture is also an extremely important determinant of health.⁸ Culture helps to determine how one feels about health and illness, how one uses health services, and the health practices in which one engages.

The environment, both indoor and outdoor, is also a powerful determinant of health. Related to this is the safety of the environment in which people work. Although many people know about the importance of outdoor air pollution to health, few people are aware of the importance of indoor air pollution to health. In many developing countries, women cook indoors with very poor ventilation, thereby creating an indoor environment that is full of smoke and that encourages respiratory illness and asthma. The lack of safe drinking water and sanitation is a major contributor to ill health in poor countries. In addition, many people in those same countries work in environments that are very unhealthy. Because they lack skills, social status, and opportunities, they may work without sufficient protection with hazardous chemicals, in polluted air, or in circumstances that expose them to occupational accidents.

Education is a powerful determinant of health for several reasons. First, it brings with it knowledge of good health practices. Second, it provides opportunities for gaining skills, getting better employment, raising one's income, and enhancing one's social status, all of which are also related to health. Studies have shown, for example, that the single best predictor of the birth weight of a baby is the level of

educational attainment of the mother.⁹ Most of us already know that throughout the world, there is an extremely strong and positive correlation between the level of education and all key health indicators. People who are better educated eat better, smoke less, are less obese, have fewer children, and take better care of their children's health than do people with less education. It is not a surprise, therefore, that they and their children live longer and healthier lives than do less well educated people and their children.

Of course, people's own health practices and behaviors are also critical determinants of their health. Being able to identify when you or a family member is ill and needs health care can be critical to good health. As noted previously, however, one's health also depends on how one eats, or if one smokes, drinks too much alcohol, or drives safely. We also know that being active physically and getting exercise regularly is better for one's health than is being sedentary.

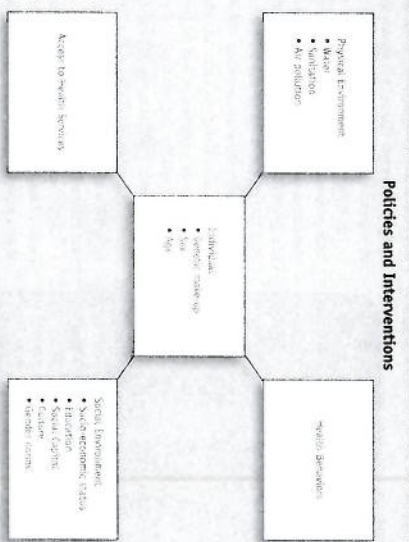
Another important determinant of future health is the way in which infants and young children are cared for and nourished and the manner in which their health is attended. Being born premature or of low birthweight can have important negative consequences on health. There is a strong correlation between the nutritional status of infants and young children and the extent to which they meet their biological

potentials, enroll in school, or stay in school. In addition, poor nutritional status in infancy and young childhood may be linked with a number of chronic diseases, including diabetes and heart disease.¹⁰

Of course, one's health does depend on access to appropriate healthcare services. Even if one is born healthy, raised healthy, and engages in good health behaviors, there will still be times when one has to call on a health system for help. The more likely you are to access services of appropriate quality, the more likely you are to stay healthy. To address the risk of dying from a complication of pregnancy, for example, one must have access to health services that can carry out an emergency cesarean section if necessary. Even if the mother had the suggested level of prenatal care and has prepared well in all other respects for the pregnancy, in the end, certain complications can only be addressed in a healthcare setting.

Finally, one should note that the approach that governments take to different policies and programs in the health sector and in other sectors has an important bearing on people's health. People living in a country that promotes high educational attainment, for example, will be healthier than people in a country that does not promote widespread education of appropriate quality, because better educated people engage in healthier behaviors. A country that has universal

FIGURE 2-1 Key Determinants of Health



Source: Data from the Public Health Agency of Canada, *Population Health Approach, What Determines Health?* Available at <http://www.phac-csp.gc.ca/phc-sp/pod/determinants/index.html>. Accessed October 6, 2005.

health insurance is likely to have healthier people than a country that does not insure all of its people, because the uninsured may lack needed health services. The same would be true, for example, for a country that promoted safe water supply for all of its people, compared to one that does not.

KEY HEALTH INDICATORS

It is critical that we use data and evidence to understand and address key global health issues. Some types of health data concern the health status of people and communities, such as measures of life expectancy and infant and child mortality, as discussed further hereafter. Some concern health services, such as the number of nurses and doctors per capita in a certain country or the indicators of coverage for certain health services, such as immunization. This book will discuss health service data only briefly, mostly in Chapter 5 on health systems. Other data concern the financing of health, such as the amount of public expenditure on health or the share of national income represented by health expenditure. This book also provides only a limited discussion of health financing, which is also primarily in the chapter on health systems.

There are a number of very important uses of data on health status, which we shall explore further and discuss throughout the book.³ We need data, for example, to know what are the health conditions from which people suffer. We also need to know the extent to which these conditions cause people to be sick, to be disabled, or to die. We need to gather

TABLE 2-1 Key Health Status Indicators

Infant Mortality Rate —The number of deaths of infants under age 1 per 1000 live births in a given year
Life Expectancy at Birth —The average number of years a newborn baby could expect to live if current mortality trends were to continue for the rest of the newborn's life
Maternal Mortality Ratio —The number of women who die as a result of pregnancy and childbirth complications per 100,000 live births in a given year
Neonatal Mortality Rate —The number of deaths to infants under 28 days of age in a given year per 1000 live births in that year
Under-Five Mortality Rate (Child Mortality Rate) —The probability that a newborn baby will die before reaching age five, expressed as a number per 1000 live births

Source: Haug A, Kane TT. Population Handbook. Washington, DC: Population Reference Bureau; 2004. World Bank. Beyond Economic Growth. Glossary. <http://www.worldbank.org/external/english/external/global/glossary.html>. Accessed April 15, 2007.

data to carry out disease surveillance. This helps us to understand if particular health problems such as influenza, polio, or malaria are occurring, where they are infecting people, who is getting these diseases, and what might be done to address them. Other forms of data also help us to understand the burden of different health conditions, the relative importance of them to different societies, and the importance that should be attached to dealing with them.

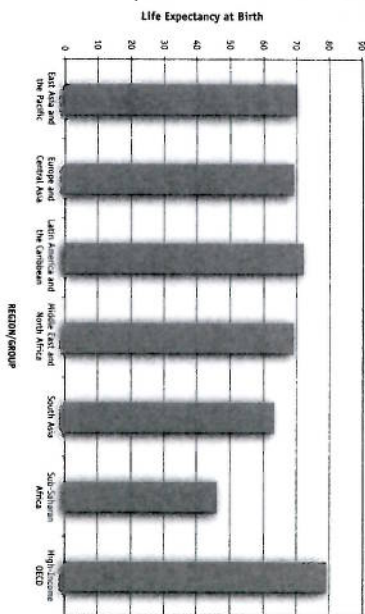
If we are to use data in the previously mentioned ways, then it is important that we use a consistent set of indicators to measure health status. In this way, we can make comparisons across people in the same country or across different countries. There are, in fact, a number of indicators that are used most commonly by those who work in global health and in development work, as well, as noted later. These are listed and defined in Table 2-1 and are discussed briefly below.

Among the most commonly used indicators of health status is "life expectancy at birth." Life expectancy at birth is "the average number of additional years a newborn baby can be expected to live if current mortality trends were to continue for the rest of that person's life."⁴ In other words, it measures how long a person born today can expect to live, if there were no change in their lifetime in the present rate of death for people of different ages. The higher the life expectancy at birth, the better the health status of a country. In the United States, life expectancy at birth is about 77 years; in a middle-income country, such as Jordan, life expectancy is 72 years; in a very poor country, such as Mali, the life expectancy is 48 years. Figure 2-2 shows life expectancy at birth by region.⁵

Another important and widely used indicator is the "infant mortality rate." The infant mortality rate is "the number of deaths of infants under age 1 per 1000 live births in a given year."⁶ This rate is usually expressed in deaths per 1000 live births. In other words, it measures how many children younger than 1 year of age will die for every 1000 who were born alive that year. Each country seeks as low a rate of infant mortality as possible, but we will see that the rate varies largely with the income status of a country. Some of the poorer countries, such as Niger, have infant mortality rates as high as 150 infant deaths for every 1000 live births, whereas in Sweden only about 3 infants die for every 1000 live births.⁷ (See Figure 2-3).

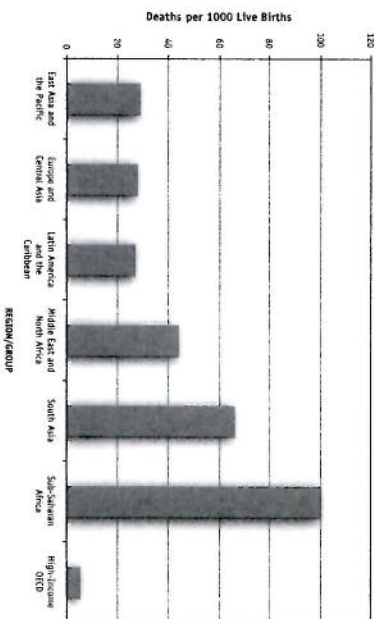
Although the infant mortality rate is a powerful indicator of health status of a country, most children younger than 1 year of age who die actually die in the first month of life. Thus, the "neonatal mortality rate" is also an important health status indicator. This rate measures "the number of deaths to infants younger than 28 days of age in a given

FIGURE 2-2 Life Expectancy at Birth, by Region, 2004



Source: Data from the World Bank. World Development Indicators, Data Query. Available at <http://data.worldbank.org>. Accessed July 10, 2006.

FIGURE 2-3 Infant Mortality Rate, by Region, 2004

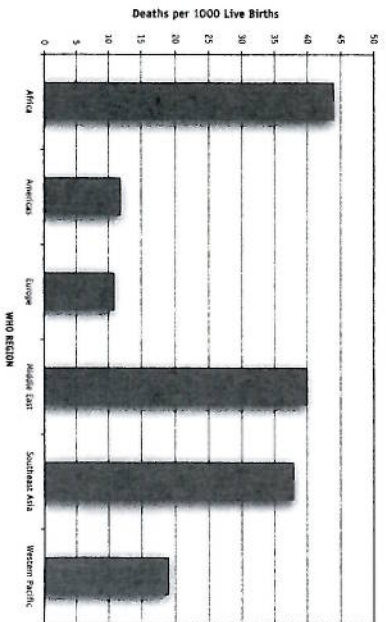


Source: Data from the World Bank. World Development Indicators, Data Query. Available at <http://data.worldbank.org>. Accessed July 10, 2006.

year, per 1000 live births in that year.¹⁰ Like the infant mortality rate, this rate will generally vary directly with the level of income of different countries. Poorer countries will have a much higher neonatal mortality rate than the richer countries. The neonatal mortality rate is about 40 per 1000 live births in Sub-Saharan Africa but below 5 per 1000 live births in developed countries.¹¹ The neonatal mortality rate by region is portrayed in Figure 2-4.

The under-five child mortality rate is also called the “child mortality rate.” This is “the probability that a newborn will die before reaching age five, expressed as a number per 1000 live births.”¹⁰ Like the infant mortality rate, this rate is also expressed per 1000 live births. Of course, this rate is very similar to the infant mortality rate, and here, too, the lower the rate the better. This rate also varies largely with the wealth of a country. In the developed countries the rate is about 20 per 1000 live births. However, in the poorest countries, the rate can be as high as 170 per 1000 live births, as in the Africa Region of the World Health Organization (WHO).¹² The under-five child mortality rate is depicted in Figure 2-5. As infant mortality declines, the under-five child mortality rate becomes a more important health indicator. The relative standing of different regions in under-five child mortality, as shown in Figure 2-5, looks very similar to that for infant mortality.

FIGURE 2-4 Neonatal Mortality Rate, by WHO Region, 2000



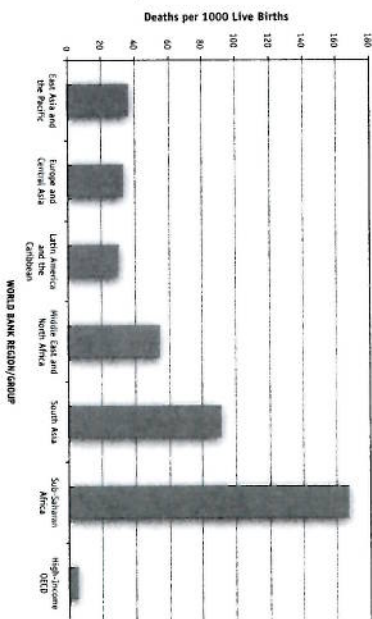
Source: Data from World Health Organization, Neonatal and perinatal mortality, country, regional, and global estimates, Geneva: WHO, 2006; Annex 2.

The maternal mortality ratio is a measure of the risk of death that is associated with childbirth. Because these deaths are more rare than infant and child deaths, the maternal mortality ratio is measured as the number of women who die as a result of pregnancy and childbirth complications per 100,000 live births in a given year.¹⁰ The rarity of maternal deaths and the fact that they largely occur in low-income settings also contributes to maternal mortality being quite difficult to measure. Very few women die in childbirth in rich countries and the maternal mortality rate in Sweden, for example, is 5 per 100,000 live births.

On the other hand, in very poor countries, in which women have low status and there are few facilities for dealing with obstetric emergencies, the rates can be over 500 per 100,000 live births, as they are in Gabon, India, and Laos.¹³ As you can see in Figure 2-6, the maternal mortality ratio is also very strongly correlated with a country's income.

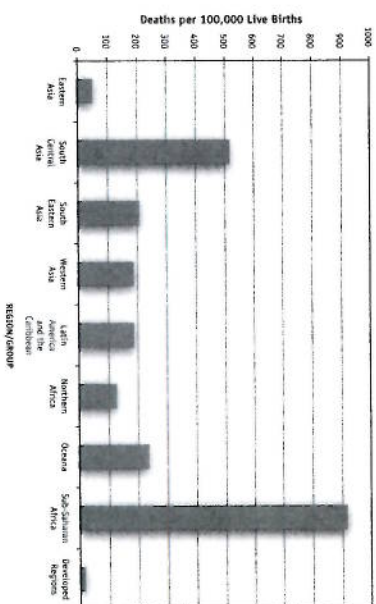
There are a few other concepts and definitions that are important to understand as we think about measuring health status, and they are summarized in Table 2-3. The first is “morbidity.” Essentially, this means sickness or any departure, subjective or objective, from a psychological or physiological state of well-being. Second is “mortality,” which refers to death. A “death rate” is the number

FIGURE 2-5 Under-five Child Mortality, by Region, 2006



Source: Data from the World Bank, World Development Indicators, Data Query. Available at <http://data.worldbank.org>. Accessed July 10, 2006.

FIGURE 2-6 Maternal Mortality, by Region, 2000



Source: Data from World Health Organization, Maternal Mortality in 2000. Estimates Developed by WHO, UNICEF & UNFPA. Available at: www.who.int/reproductive_health/publications/maternal_mortality. Accessed July 10, 2006.

of deaths per 1000 population in a given year.¹⁹ The third is "disability." Although some conditions cause people to get sick or die, they might also cause people to suffer the "temporary or long-term reduction in a person's capacity to function."²⁰

There will also be considerable discussion in this book and most readings on global health of the "prevalence" of health conditions. This refers to the number of people suffering from a certain health condition over a specific time period. It measures the chances of having a disease. For global health work, one usually refers to "point prevalence" of a condition, which is "the proportion of the population that is diseased at a single point in time."²¹ The point prevalence of HIV/AIDS among adults in South Africa, for example, is estimated to be between 17% and 21%. This means that today between 17% and 21% of all adults between the ages of 15 and 49 in South Africa are HIV positive.²²

The "incidence rate" is also a very commonly used term. This refers to the rate at which new cases of a disease occur in a population. Incidence measures the chances of getting a disease. Incidence rate is "the number of persons contracting a disease per 1000 population at risk for a given period of time."²³ It is usually specified as the number of people getting the disease over a year, per 100,000 people at risk. In India, for example, the incidence rate for TB is 168 per 100,000.²⁴ This means that for every 100,000 people in India, 168 in the last year got TB.

Many people confuse incidence rate and prevalence rate. It may be convenient to think of prevalence as the pool of people with a disease at a particular time and incidence as the flow of new cases of people with that disease each year into that pool. You should note, of course, that the size of the pool will vary as new cases flow into the pool and old cases flow out, as they die or are cured.

Finally, one needs to be familiar with how diseases get classified. When you read about health, there will be discussions of communicable diseases, non-communicable diseases, and injuries. Communicable diseases are also called infectious diseases. These are illnesses that are caused by a particular infectious agent and that spread directly or indirectly from people to people, animals to people or people to animals.²⁵ Examples of communicable diseases include influenza, measles, and HIV. Non-communicable diseases are illnesses that are not spread by any infectious agent, such as hypertension, coronary heart disease, and diabetes. Another category of health conditions is "injuries." These usually include, among other things, road traffic injuries, falls, self-inflicted injuries, and violence.²⁶

MEASURING THE BURDEN OF DISEASE

We have already seen in Chapter 1 that the definition of health is "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." Those who work on global health have attempted for a number of years to construct a single indicator that could be used to compare how far different countries are from the state of good health, as defined previously. Ideally, such an index would take account of morbidity, mortality, and disability; allow one to calculate the index by age, by gender, and by region; and, allow one to make comparisons of health status across regions within a country and across countries.²⁷ This kind of index would measure what is generally referred to as "the burden of disease."

One such indicator is "Health-Adjusted Life Expectancy," or HALE. It is a "health expectancy measure." The HALE "summarizes the expected number of years to be lived in what might be termed the equivalent of good health."²⁸ This can also be seen as "the equivalent number of years in full health that a newborn can expect to live, based on current rates of ill health and mortality."²⁹ To calculate the HALE, "the years of ill health are weighted according to severity and subtracted from the overall life expectancy."³⁰

WHO calculated HALEs for most countries, using a standard methodology. Table 2-2 shows life expectancy at birth in 2000 for a number of low-, middle-, and high-income countries and how it compares with HALEs for those countries in the same year. As you can see from Table 2-2, the greater the number of years that people in any population are likely to spend in ill health or with disability, the greater the difference will be between life expectancy at birth and health-adjusted life expectancy.

The composite indicator of health status that is most commonly used in global health work is called the "Disability Adjusted Life Year," or DALY. This indicator was first used in conjunction with the 1993 World Development Report of the World Bank, and is a "health gap measure." It is now used in burden of disease studies. In the simplest terms, a DALY is:

... a unit for measuring the amount of health lost because of a particular disease or injury. It is calculated as the present value of future years of disability free life that are lost as the result of the premature deaths or causes of disability occurring in a particular year.³¹

The DALY is a measure of premature deaths and losses due to illnesses and disabilities in a population. A DALY

TABLE 2-2 Life Expectancy at Birth and Health Adjusted Life Expectancy, Selected Countries, 2004

Country	Life Expectancy/Health Adjusted Life Expectancy	
	Males	Females
Algeria	42/35.3	42/35.8
Argentina	71/62.5	78/68.1
Bangladesh	62/55.3	63/53.3
Bolivia	63/53.6	66/55.2
Brazil	67/57.2	74/62.4
Cambodia	51/45.6	58/49.5
Cameroon	50/41.1	51/41.8
Canada	78/70.1	83/74.0
Chile	74/64.9	81/69.7
China	70/63.1	74/65.2
Costa Rica	73/65.2	80/69.3
Cuba	73/67.1	80/69.5
Denmark	75/68.6	80/71.1
Ethiopia	49/40.7	51/41.7
China	56/49.2	58/50.3
Haiti	53/43.5	56/44.1
India	61/53.3	63/53.6
Indonesia	65/57.4	68/58.9
Jordan	69/59.7	73/62.3
Malaysia	69/61.6	74/64.8
Nepal	61/52.5	61/51.1
Niger	42/35.8	41/35.2
Nigeria	45/41.3	46/41.8
Pakistan	62/54.2	63/52.3
Peru	69/59.6	73/62.4
Philippines	65/57.1	72/61.5
Singapore	77/68.8	82/71.3
Sri Lanka	68/59.2	75/64.0
Turkey	69/61.2	73/62.8
United States of America	75/67.2	80/71.3
Vietnam	69/59.8	74/62.9

Source: Data from WHO. Core Health Indicators. Available at: http://www3.who.int/whosis/core_select_process.cfm. Accessed September 24, 2006.

measures how many healthy years of life are lost between the population being measured and the "healthiest" possible population, which is used as a standard. It does this by adding together the losses of healthy years of life that occur from illness, disability, and death. The value of disability is based on values that have been established for the severity of different disabling conditions. The calculation of a DALY "discounts" losses so that losses from ill health, disability, and death in the future are worth less than losses that occur today, just as a dollar you get in the future will be worth less

than one you would get today.^{32, 33} This is why the DALY is referred to as a "present value."

For calculating DALYs, health conditions are generally broken down into three categories:³⁴

Group 1—communicable, maternal and perinatal conditions, (meaning in the first week after birth), and nutritional disorders

Group 2—non-communicable diseases

Group 3—injuries, including among other things, road traffic accidents, falls, self-inflicted injuries, and violence

To get a better sense of the meaning of DALYs, it will be valuable to construct a few simple examples of what goes into their calculation and how they would be used. Consider, for example, that a male can expect under the standard used to live to be 80 years old. Now let us suppose that this person dies of a heart attack at 40 years of age. That person would have lost 40 years of life. The value of this loss, discounted to the present, would be part of the calculation of DALYs.

Let us also imagine that a woman, who is 40 years of age, has diabetes that has disabled her in a number of ways. In principle, she should live to the standard used of 82.5 years of age. In practice, however, the person's disability is so severe that her quality of life is equal to only about half of what it would be if she were in a "disease free" state. Even if she were to live to be 80 years of age, therefore, she would have lost about half of the quality of her last 42.5 years due to disability. The value of this loss, discounted to the present, would also be part of the calculation of DALYs.

The DALYs for the society in which the two people are living would be a composite of the data calculated from the losses due to the premature death of the first person and the disability of the second.

In reality, of course, many health conditions produce both disability and premature death. Let us suppose that a man gets TB at 45 years of age. In the absence of treatment, let us say that he dies at 47 years of age. He suffered two years of disability and lost 33 years of life due to his illness, compared to the standard used for longevity. A person who suffers a severe road traffic injury at age 50 may live, let us say, 10 years with severe disability due to his injuries and then at age 60 die due to those injuries. He would have lost quality of life years during the period of his disability and 20 years of life from premature death, compared to the standard against which DALYs are calculated.

A society that has more premature death, illness, and disability has more DALYs than a society that is healthier and has less illness, disability, and premature death. One of the goals of health policy is to avert these DALYs in the most cost-efficient manner possible. If, for example, a society is losing many hundreds of thousands of DALYs due to malaria that is not diagnosed and treated in a timely and proper manner, what steps can be taken to avert those DALYs at the lowest cost?

An important point to remember when considering DALYs compared to measuring deaths, is that DALYs take account of periods in which people are living in ill health or with disability. By doing this, DALYs and other composite indicators try to give a better estimate than measuring deaths alone of the true "health" of a population. This is easy to understand. Most mental health problems, for example, are

not associated with deaths. However, they cause an enormous amount of disability. Several parasitic infections, such as schistosomiasis, also cause very few deaths, but enormous amounts of illness and disability. If we measured the health of a population with an important burden of schistosomiasis and mental illness only, by measuring deaths, we would miss a major component of morbidity and disability and would seriously overestimate the health of that population. The next section on the global burden of disease will make the concept of DALYs clearer to you, especially as you see how DALYs compare to deaths for a number of health conditions. Other sections of the book will also make extensive use of the concept of DALYs.

Indeed, calculating DALYs requires information on disease prevalence and incidence that is not always available. In addition, the health expectancy measures are more widely used in developed countries, given the health information available to them. A number of critiques of DALYs have been written.³² Nonetheless, this book will repeatedly refer to DALYs because this measure is so extensively used in global health work. In addition, a considerable amount of important analysis has been carried out that is based on the use of DALYs for measuring overall health status and assessing the most cost-effective approaches to dealing with various health problems. These uses of the DALY will be discussed in Chapter 3.

THE GLOBAL BURDEN OF DISEASE

Overview

As you start a review of global health, it is important to get a clear picture of the leading causes of illness, disability, and death in the world. As noted earlier, it is also very important to understand how they vary by age, sex, ethnicity, and socioeconomic status, both within and across countries. It is also essential to understand how these causes have varied over time and how they might change in the future. These topics are examined briefly below and in much greater detail throughout the book.

Table 2-3 shows the 10 leading causes of death and the 10 leading causes of DALYs lost for low- and middle-income countries and for high-income countries. Both deaths and DALYs are ranked in order of importance.

The table indicates that the leading causes of death in low- and middle-income countries are non-communicable diseases, which account for about 54% of all deaths. This is followed by communicable diseases at about 36% of all deaths and then injuries at about 10% of all deaths.³³

In order of rank, heart attacks and strokes are the two leading causes of death in low- and middle-income countries,

TABLE 2-3 The 10 Leading Causes of Death and DALYs, 2001

Low- and middle-income countries		High-income countries	
Cause	Percentage of total deaths	Cause	Percentage of total deaths
1. Ischemic heart disease	11.8	1. Ischemic heart disease	17.3
2. Cerebrovascular disease	9.5	2. Cerebrovascular disease	9.9
3. Lower respiratory infections	7.0	3. Trachea, bronchus, and lung cancers	5.8
4. HIV/AIDS	5.3	4. Lower respiratory infections	4.4
5. Perinatal conditions	5.1	5. Chronic obstructive pulmonary disease	3.8
6. Chronic obstructive pulmonary disease	4.9	6. Colon and rectal cancers	3.3
7. Diarrheal diseases	3.7	7. Alzheimer's and other dementias	2.6
8. Tuberculosis	3.3	8. Diabetes mellitus	2.6
9. Malaria	2.5	9. Breast cancer	2.0
10. Road traffic accidents	2.2	10. Stomach cancer	1.9
Cause	Percentage of total DALYs	Cause	Percentage of total DALYs
1. Perinatal conditions	6.4	1. Ischemic heart disease	8.3
2. Lower respiratory infections	6.0	2. Cerebrovascular disease	6.3
3. Ischemic heart disease	5.2	3. Unipolar depressive disorders	5.6
4. HIV/AIDS	5.1	4. Alzheimer's and other dementias	5.0
5. Cerebrovascular disease	4.5	5. Trachea, bronchus, and lung cancers	3.6
6. Diarrheal Diseases	4.2	6. Hearing loss, adult onset	3.6
7. Unipolar depressive disorders	3.1	7. Chronic obstructive pulmonary disease	3.5
8. Malaria	2.9	8. Diabetes mellitus	2.8
9. Tuberculosis	2.6	9. Alcohol use disorders	2.8
10. Chronic obstructive pulmonary disease	2.4	10. Osteoarthritis	2.5

Source: Adapted with permission from The World Bank, Lopez AD, Murray CL. The burden of disease and mortality by condition: data, methods, and results for 2001. In: Lopez AD, Mathers CD, Ezzani M, Jamison DT, Murray CL, eds. *Global Burden of Disease and Risk Factors*. New York: Oxford University Press, 2006.

However, all but one of the next leading causes of death in these countries is communicable. The third leading cause of death is lower respiratory conditions, related to pneumonia, often in children. The fourth leading cause is HIV/AIDS. The next are perinatal conditions, linked with the death of newborns. TB, diarrheal disease, and malaria are also major killers. Road traffic accidents are the 10th leading cause of death in low- and middle-income countries.³⁵

Non-communicable diseases are also the leading causes of deaths in high-income countries. However, in other respects, the picture of deaths that emerges in high-income countries is quite different from that in low- and middle-income countries. In high-income countries almost 87% of the deaths are from non-communicable causes, 7.5% are from injuries, and only 5.7% are from communicable causes. In high-income countries, the first three leading causes of

death are heart disease, stroke, and lung cancers. The fourth, and the only communicable cause among the leading causes of death, is lower respiratory infections, which is associated in high-income countries mostly with death from pneumonia of older people. Colon and rectal cancers are the fifth leading cause of death and diabetes is the sixth.³⁵

If we look at DALYs, rather than deaths, for low- and middle-income countries, communicable diseases and injuries become slightly more important and non-communicable diseases somewhat less important in percentage terms than they were for deaths. In terms of individual conditions, diarrheal disease, malaria, and perinatal conditions become more important percentages than they were for deaths. However, the most significant difference is for unipolar depressive disorders (depression), which were not in the 10 leading causes of death, but which are in the 10 leading causes of

DALYs. This stems from the fact that this mental illness, which is discussed more in Chapter 12, is not associated with many deaths but is associated with an exceptional amount of disability in almost all countries. In fact, when we look at DALYs computed to deaths for high-income countries, the relative shares of DALYs by cause group is generally not very different than it is for deaths. However, for high-income

countries, as well as low- and middle-income countries, unipolar depressive disorders become very important, as do Alzheimer's disease and other dementias.

Causes of Death by Region

As you would expect, the burden of disease varies by region, as shown in Table 2-4. In general, the higher the level of

TABLE 2-4 The Ten Leading Causes of the Burden of Disease in Low- and Middle-Income Countries by Region, 2001

East Asia and Pacific		Europe and Central Asia		Percentage of total DALYs	
	Percentage of total DALYs		Percentage of total DALYs		Percentage of total DALYs
1. Cerebrovascular disease	7.5	1. Ischemic heart disease	15.9		
2. Perinatal conditions	5.4	2. Cerebrovascular disease	10.8		
3. Chronic obstructive pulmonary disease	5.0	3. Unipolar depressive disorders	3.7		
4. Ischemic heart disease	4.1	4. Self-inflicted injuries	2.3		
5. Unipolar depressive disorders	4.1	5. Hearing loss, adult onset	2.2		
6. Tuberculosis	3.1	6. Chronic obstructive pulmonary disease	2.0		
7. Lower respiratory infections	3.1	7. Trachea, bronchus, and lung cancers	2.0		
8. Road traffic accidents	3.0	8. Osteoarthritis	2.0		
9. Cataracts	2.8	9. Road traffic accidents	1.9		
10. Diarrheal diseases	2.5	10. Poisonings	1.9		
Latin America and the Caribbean		Middle East and North Africa		Percentage of total DALYs	
1. Perinatal conditions	6.0	1. Ischemic heart disease	6.6		
2. Unipolar depressive disorders	5.0	2. Perinatal conditions	6.3		
3. Violence	4.9	3. Road traffic accidents	4.6		
4. Ischemic heart disease	4.2	4. Lower respiratory infections	4.5		
5. Cerebrovascular disease	3.8	5. Diarrheal diseases	3.9		
6. Endocrine disorders	3.0	6. Unipolar depressive disorders	3.1		
7. Lower respiratory infections	2.9	7. Congenital anomalies	3.1		
8. Alcohol use disorders	2.8	8. Cerebrovascular disease	3.0		
9. Diabetes mellitus	2.7	9. Vision disorders, age-related	2.7		
10. Road traffic accidents	2.6	10. Cataracts	2.3		
South Asia		Sub-Saharan Africa		Percentage of total DALYs	
1. Perinatal conditions	9.2	1. HIV/AIDS	16.5		
2. Lower respiratory infections	8.4	2. Malaria	10.3		
3. Ischemic heart disease	6.3	3. Lower respiratory infections	8.8		
4. Diarrheal diseases	5.4	4. Diarrheal diseases	6.4		
5. Unipolar depressive disorders	3.6	5. Perinatal conditions	5.8		
6. Tuberculosis	3.4	6. Measles	3.9		
7. Cerebrovascular disease	3.2	7. Tuberculosis	2.3		
8. Cataracts	2.3	8. Road Traffic Accidents	1.8		
9. Chronic obstructive pulmonary disease	2.3	9. Pertussis	1.8		
10. Hearing loss, adult onset	2.0	10. Protein-energy malnutrition	1.5		

Source: Adapted with permission from The World Bank, Lopez AD, Mathers CD, Murray CL. The Burden of Disease and Mortality by Condition: Data, Methods, and Results for 2001. In: Lopez AD, Mathers CD, Ezzani M, Jamison DT, Murray CL, eds. *Global Burden of Disease and Risk Factors*. New York: Oxford University Press, 2006:91.

income within the region, the more likely it is that the leading causes of the burden of disease will be non-communicable. The lower the level of income, the more likely it is that the leading causes of the burden of disease will be communicable. What is most important to note is the remarkable extent to which the burden of disease in the Africa region remains dominated by communicable diseases. The relative importance of communicable diseases in the South Asia Region

also sets that region apart. Throughout the book, in fact, the relatively high burden of communicable diseases in South Asia and Sub-Saharan Africa will be highlighted.³⁶

Causes of Death by Age

Tables 2-5 and 2-6 show the leading causes of death by age group for both low- and middle-income countries and high-income countries.

TABLE 2-5 The Ten Leading Causes of Death in Children Ages 0–14, by Broad Income Group, 2001

Low- and middle-income countries		High-income countries	
Cause	Percentage of total deaths	Cause	Percentage of total deaths
Perinatal conditions	20.7	Perinatal conditions	33.9
Lower respiratory infections	17.0	Congenital anomalies	20.0
Diarrheal diseases	13.4	Road traffic accidents	5.9
Malaria	9.2	Lower respiratory infections	2.5
Measles	6.2	Endocrine disorders	2.4
HIV/AIDS	3.7	Drownings	2.4
Congenital anomalies	3.7	Leukemia	1.9
Whooping cough	2.5	Violence	1.8
Tetanus	1.9	Fires	1.2
Road traffic accidents	1.5	Meningitis	1.2

Source: Adapted with permission from The World Bank, Lopez A, Beggs S, Bos E. Demographic and Epidemiological Characteristics of Major Regions, 1990–2001. In: Lopez A, Mathers C, Ezzani M, Jamison D, Murray C, eds. *Global Burden of Disease and Risk Factors*. New York: Oxford University Press, 2006:70.

TABLE 2-6 The Ten Leading Causes of Death in Adults 15–59, by Broad Income Group, 2001

Low- and middle-income countries		High-income countries	
Cause	Percentage of total deaths	Cause	Percentage of total deaths
HIV/AIDS	14.1	Ischemic heart disease	10.8
Ischemic heart disease	8.1	Self-inflicted injuries	7.2
Tuberculosis	7.1	Road traffic accidents	6.9
Road traffic accidents	5.0	Trachea, bronchus, and lung cancers	6.8
Cerebrovascular disease	4.9	Cerebrovascular disease	4.4
Self-inflicted injuries	4.0	Cirrhosis of the liver	4.4
Violence	3.1	Breast cancer	4.0
Lower respiratory infections	2.3	Colon and rectal cancers	3.1
Cirrhosis of the liver	2.2	Diabetes mellitus	2.1
Chronic obstructive pulmonary disease	2.2	Stomach cancer	2.0

Source: Adapted with permission from The World Bank, Lopez A, Beggs S, Bos E. Demographic and Epidemiological Characteristics of Major Regions, 1990–2001. In: Lopez A, Mathers C, Ezzani M, Jamison D, Murray C, eds. *Global Burden of Disease and Risk Factors*. New York: Oxford University Press, 2006:70.

It is clear from Table 2-5 that children in low- and middle-income countries die overwhelmingly of communicable diseases that are no longer problems in the more developed countries. You can also see that HIV/AIDS and TB are among the leading causes of death in low- and middle-income countries among adults, while no communicable disease is among the 10 leading causes of death in the high-income countries.

Causes of Death by Gender

It is also important to examine deaths by gender. Table 2-7 shows deaths by gender for low- and middle-income countries.

For this group of countries, the causes of death among men and women are largely alike. However, it is important to note that, even in these countries, heart disease and stroke are the leading causes of death among both genders, that men die much more than women of road traffic accidents, and that diabetes has become the 10th leading cause of death among women.

Trends

Between 1960 and 2002, life expectancy at birth for the world as a whole increased from 50 to 67. In addition, as shown in Table 2-8 below, life expectancy at birth declined in

TABLE 2-7 The Ten Leading Causes of Death Ordered by Sex, in Low- and Middle-Income Countries, 2001

Males		Females	
Cause	Percentage of total deaths	Cause	Percentage of total deaths
Ischemic heart disease	11.8	Ischemic heart disease	10.8
Cerebrovascular disease	8.5	Cerebrovascular disease	7.2
Lower respiratory infections	6.7	Lower respiratory infections	6.9
Perinatal conditions	5.4	HIV/AIDS	6.8
HIV/AIDS	5.4	Chronic obstructive pulmonary disease	4.4
Chronic obstructive pulmonary disease	4.7	Perinatal conditions	4.4
Tuberculosis	4.1	Diarrheal diseases	4.0
Diarrheal diseases	3.6	Malaria	3.1
Road traffic accidents	3.1	Tuberculosis	2.1
Malaria	2.3	Diabetes mellitus	2.0

Source: Adapted with permission from The World Bank, Lopez A, Beggs S, Bos E. *Demographic and Epidemiological Characteristics of Major Regions, 1990-2001*. In: Lopez A, Mathers G, Ezzani M, Jamison D, Murray C, eds. *Global Burden of Disease and Risk Factors*. New York: Oxford University Press, 2006:70.

TABLE 2-8 Life Expectancy, 1960-2002, by World Bank Region

World Bank Region	Life expectancy (years)		
	1960	1990	2002
East Asia and the Pacific	39	67	70
Europe and Central Asia		69	69
Latin America and the Caribbean	56	68	71
Middle East and North Africa	47	64	69
South Asia	44	58	63
Sub-Saharan Africa	40	50	46
High-income countries	69	76	78

Source: Data with permission from The World Bank, Jamison DT. *Investing in Health*. In: Jamison DT, Brauman IG, Measham AR, et al., eds. *Disease Control Priorities in Developing Countries*. New York: Oxford University Press, 2006:3-36.

No data for Europe and Central Asia for 1960

Sub-Saharan Africa and stayed the same in Europe and Central Asia. The rise in life expectancy in most regions has been associated with overall economic development and some important improvements in the health of children, partly as a result of better coverage of health interventions for children under five years. The decline in life expectancy at birth in Sub-Saharan Africa from 1990 to 2002 is attributable to the spread of HIV/AIDS. The lack of improvement in life expectancy at birth in Europe and Central Asia is largely attributed to the social issues that arose in the former Soviet Union, including alcoholism, which has led to an increase in adult mortality, especially among men. These points are discussed in greater detail later.⁸

As we look forward, we can forecast that communicable diseases will continue to be very important to the burden of disease in South Asia and Sub-Saharan Africa. However, barring the advent of a new or emerging infectious disease, the exceptional worsening of the HIV/AIDS pandemic, or a continuing long-run failure of Sub-Saharan Africa to grow economically, the non-communicable diseases will become increasingly important everywhere.

The Burden of Deaths and Disease within Countries

As you consider causes of death and the burden of disease globally and by region, age, and sex, it is also important to consider how deaths and DALYs would vary within countries, by gender, ethnicity, and socioeconomic status. In the most low- and middle-income countries, the answer to this is relatively simple:

- Rural people will be less healthy than urban people
- Disadvantaged ethnic minorities will be less healthy than majority populations
- Women will suffer a number of conditions that relate to their relatively weak social positions
- Poor people will be less healthy than better-off people
- Uneducated people will be less healthy than better educated people

In addition, people of lower socioeconomic status will have higher rates of communicable diseases, illness, and death related to maternal causes and malnutrition than will people of higher status. Lower socioeconomic status people will also suffer from a larger burden of disease related to smoking, alcohol, and diet than would be the case for better-off people. These points are fundamental to understanding global health and will also be highlighted throughout the book.

RISK FACTORS

As we discuss the determinants of health and how health status is measured, there will be many references to "risk factors" for various health conditions. A risk factor is "an aspect or personal behavior or life-style, an environmental exposure, or an inborn or inherited characteristic, that, on the basis of epidemiologic evidence, is known to be associated with health-related condition(s) considered important to prevent."⁹ Risks that relate to health can also be thought of as "a probability of an adverse outcome, or a factor that raises this probability."¹⁰ We are all familiar with the notion of risk factors from our own lives and from encounters with health services. When we answer questions about our health history, for example, we are essentially helping to identify the most important risk factors that we face ourselves. Do our parents suffer from any health conditions that might affect our own health? Are we eating in a way that is conducive to good health? Do we get enough exercise and enough sleep? Do we smoke or drink alcohol excessively? Are there any special stresses in our life? Do we wear seat belts when we drive?

If we extend the idea of risk factors to poor people in low- and middle-income countries, then we might add some other questions that relate more to the ways that they live. Does the family have safe water to drink? Do their house and community have appropriate sanitation? Does the family cook indoors in a way that makes the house smoky? Do the father and mother work in places that are safe environmentally? We might also have to ask if there is war or conflict in the country, because they are also important risk factors for illness, death, and disability.

If we are to understand how the health status of people can be enhanced, particularly poor people in low- and middle-income countries, then it is very important that we understand the risk factors to which their health problems relate. Table 2-9 shows the relative importance of different risk factors to deaths and DALYs in low- and middle-income countries, compared to high-income countries. These are shown in the table in order of their importance by category of risk.

When we consider low- and middle-income countries, the most striking factor is the extent to which malnutrition is a risk factor. Another important point is the extent to which other nutrition-related risk factors are important for deaths and DALYs, such as high blood pressure and high cholesterol. Deaths and DALYs attributable to the risks of smoking and unsafe sex make up the other most significant risk factors in low- and middle-income countries.¹¹

TABLE 2-9 The Leading Risk Factors for the Burden of Disease, 2001, Low- and Middle-Income and High-Income Countries, Ranked in Order of Percent

Low- and Middle-Income Countries		High-Income Countries	
Deaths	DALYs	Deaths	DALYs
High blood pressure (12.9)	Childhood underweight (8.7)	Smoking (12.7)	Smoking (12.7)
Childhood underweight (7.5)	Unsafe sex (5.8)	High blood pressure (17.6)	High blood pressure (9.3)
Smoking (6.9)	High blood pressure (5.6)	High cholesterol (10.7)	Overweight and obesity (7.2)
High cholesterol (6.3)	Smoking (3.9)	Overweight and obesity (7.8)	High cholesterol (6.3)
Unsafe sex (5.8)	Unsafe water, sanitation, and hygiene (3.7)	Physical inactivity (4.8)	Alcohol use (4.4)
Low fruit and vegetable intake (4.8)	Alcohol use (3.6)	Low fruit and vegetable intake (4.2)	Physical inactivity (3.2)
Alcohol use (3.9)	High cholesterol (3.1)	Urban air pollution (1.0)	Low fruit and vegetable intake (2.7)
Indoor smoke from household use of solid fuels (3.7)	Indoor smoke from household use of solid fuels (3.0)	Illicit drug use (0.5)	Unsafe sex (0.6)
Overweight and obesity (3.6)	Low fruit and vegetable intake (2.4)	Unsafe sex (0.4)	Iron-deficiency anemia (0.5)
Unsafe water, sanitation, and hygiene (3.2)	Overweight and obesity (2.3)	Alcohol use (0.3)	Child sexual abuse (0.5)

Source: Data with permission from The World Bank, Lopez AD, Mathers CD, Ezzati M, Jamison DT, Murray CJ, eds. *Global Burden of Disease and Risk Factors*, 1990-2001. New York: Oxford University Press, 2006: 10.

In high-income countries, there is little undernutrition but a considerable amount of overweight and obesity. It is not surprising, therefore, that three of the most important risk factors for both deaths and DALYs in high-income countries are high blood pressure, high cholesterol, and overweight and obesity. Nor is it surprising that, despite important progress in reducing the prevalence of smoking in some countries, tobacco remains the leading risk factor for both deaths and DALYs in high-income countries.⁴¹

from a burden of disease profile that is dominated primarily by communicable diseases to one that it dominated primarily by non-communicable diseases. Both of these important transitions are discussed further below.

Demographic Transitions⁴³

When we look back historically at the countries that are now high-income, we can see that they had long periods historically when fertility was high, mortality was high, and population growth was, therefore, relatively slow, or which might even have declined in the face of epidemics. Beginning around the turn of the nineteenth century, however, mortality in those countries began to decline as hygiene and nutrition improved and the burden of infectious diseases became less. In most cases, this decline in mortality went before much decline in fertility. As mortality declined, the population increased and the share of the population that was of younger ages also increased. Later, fertility began to decline and, as births and deaths became more equal, population growth slowed. As births and deaths stayed more equal, the share of the population that was of older ages increased.

The demographic transition is shown graphically in Figure 2-7.

The first population pyramid reflects a country with high fertility and high mortality. The second population pyramid is indicative of a country in which mortality has begun to decline but fertility remains high. This would be similar to the demographics one would find, for example, in a number of countries in Sub-Saharan Africa that are undergoing demographic transition. The third pyramid looks more like a cylinder than a pyramid. This reflects a population in which fertility has been reduced and in which there is a larger share of older people in the population than in the first and second pyramids. This would be similar to the demographics that one would find in a number of low fertility, aging populations in Western Europe.

The Epidemiologic Transition⁴⁴

The epidemiologic transition is closely related to the demographic transition, as suggested throughout the previous discussion. Historically there has been a shift in the patterns of disease that follows the trends noted below:

- First, high and fluctuating mortality, related to very poor health conditions, epidemics, and famine

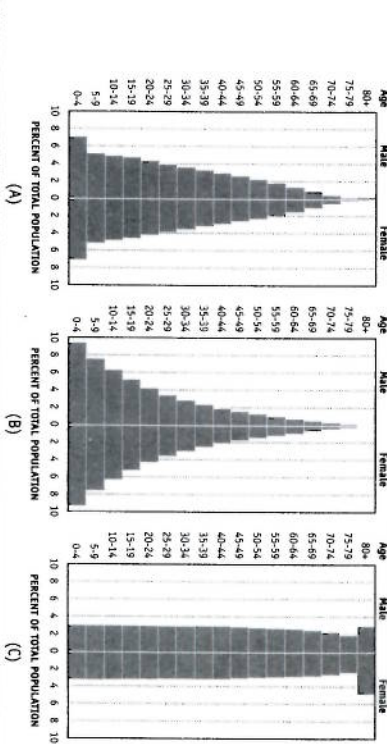
- Then, progressive declines in mortality, as epidemics become less frequent
- Finally, further declines in mortality, increases in life expectancy, and the predominance of non-communicable diseases

Figure 2-8 shows examples of two sets of countries. The first has a burden of disease profile that is pretransition. The second is of a developed country that has completed its epidemiological transition.

You can see in Figure 2-8 how the pattern of disease differs between the two types of countries. You can also see the changes that will occur over time, as the low-income country develops and the burden of disease moves from one that is predominantly communicable diseases to one that is predominantly non-communicable diseases.

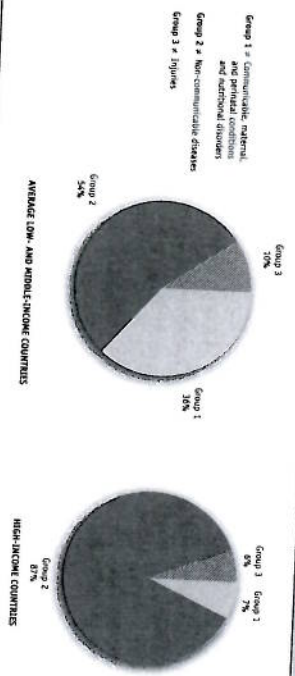
The pace of the epidemiological transition in different societies depends on a number of factors related to the “determinants of health” that were discussed earlier. In its early stages, the transition appears to depend primarily on improvements in hygiene, nutrition, education, and socioeconomic status. Some improvements also stem from advances in public health and in medicine, such as the development of new vaccines and antibiotics.⁴⁵ Most of the countries that

FIGURE 2-7 The Demographic Transition: (A) High Fertility/High Mortality; (B) Declining Mortality/High Fertility; (C) Reduced Fertility/Reduced Mortality



Source: Reprinted from U.S. Census Bureau: International population reports WP-02, *Global Population Profile 2002*. Washington, DC: U.S. Government Printing Office, 2004:35.

FIGURE 2-8 The Burden of Disease by Group of Cause, Percent of Deaths, 2001



Source: Data with permission from The World Bank, Lopez AD, Mathers CD, Murray CL, Murray QJL. The burden of disease and mortality by condition, data, methods, and results for 2001. In: Lopez AD, Mathers CD, Ezzati M, Jamison DT, Murray QJL, eds. *Global Burden of Disease and Risk Factors*. New York: Oxford University Press; 2006.

are now high-income went through epidemiologic transitions that were relatively slow, with the exception of Japan. Most developing countries have already begun their transition. However, it is still far from complete in most of them.

Implications of the Demographic and Epidemiological Transitions

There are several especially important points about these transitions that one must keep in mind.

- The large share of the population that is younger in relatively poor societies with high fertility has an enormous implication for the funds that countries must spend on education, health, and some other key investments.
- As countries age, they face pressure to fund the health of their older population, who tend to suffer from non-communicable diseases. They also face pressure on the funding of pension schemes for their older workers, because there is a large share of workers who have retired but a relatively smaller share of young people who pay taxes into the pension fund. This is now the case, for example, in much of Western Europe.

- Most low-income countries are in an ongoing epidemiologic transition and many of them, therefore, face significant burdens of communicable and non-communicable diseases, and injures at the same

time. This strains the capacity of the health system of many of these countries. It is also expensive for countries that are resource poor to address a substantial burden of all three of these types of diseases simultaneously.

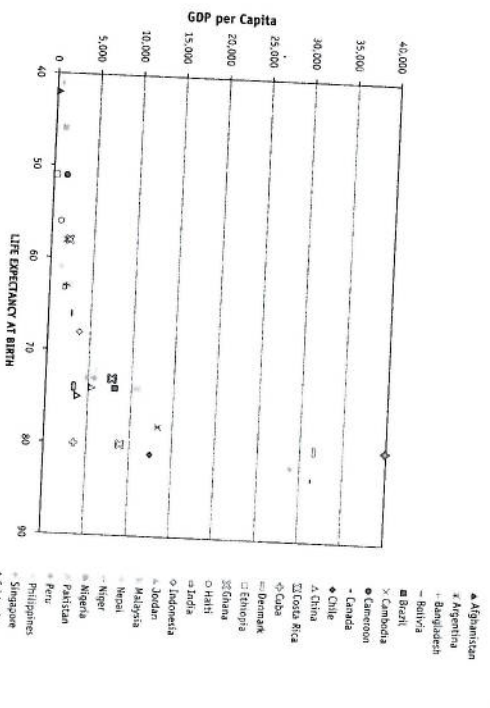
In fact, the demographic and epidemiological transitions have many important implications for public policy, some of which were noted earlier. From the point of view of this text, however, one especially important question that policy makers in low-income countries face concerning these transitions and epidemiological transitions in our country at lowest possible cost, in a manner consistent with the social values of the country?

Figure 2-9 shows national income of a sample of countries, plotted against life expectancy at birth for females in those countries.

From this figure, one can see that, generally, the health of a country does increase as national income rises. However, one can also see that there are some countries, such as China, Costa Rica, Cuba, and Sri Lanka, that have achieved higher average life expectancies at birth than one would have predicted for countries at their level of income.

- To a large extent, countries like those above achieved these important health gains as a result of:
 - Focusing on investing in nutrition, health, and education, particularly of their poor people

FIGURE 2-9 Gross Domestic Product Per Capita and Female Life Expectancy at Birth, Selected Countries, 2004



Source: Data from WHO. *Core Health Indicators*. Available at http://www3.who.int/whosis/core_health_indicators. Accessed September 24, 2006.

- Improving people's knowledge of good hygiene
- Making selected investments in health services that at low cost could have a high impact on health status, such as vaccination programs for children and TB control

These themes will also be discussed throughout this book.

Indeed, in the long run, economic progress will help to bring down fertility, reduce mortality from communicable diseases, and help to produce a healthier population. However, at the present rates of progress in improving health in most low-income countries, these changes will take a very long time to occur. One great public policy challenge for these countries and their governments, therefore, is how they can "short-circuit" this process and reach reduced levels of fertility, lower mortality, and better health for their people, even as they remain relatively poor.

CASE STUDY

The State of Kerala

Having begun to review health status and how countries can speed improvements in health, it will be valuable to end this chapter by examining a well-known case of a place that improved health status considerably, even at relatively low levels of income. One of the best known of such success stories concerns Kerala State in India.

Introduction

Kerala is a coastal state in Southwestern India with a population of more than 31 million people.¹ Despite having only lower rates of economic growth and a state per capita income lower than that of many other states in India, the health indicators for Kerala are the best in India and rival those in

developed countries. What approach did Kerala take historically to produce such high levels of health, even in the face of relatively low income? What factors contributed to improvements in health status? What lessons does the Kerala experience suggest for other countries and for other states within India?

The Kerala Approach

One of the primary reasons why people in Kerala have such high levels of health has been the emphasis that the state put on education and the exceptionally widespread access to education in Kerala. The state introduced free primary and secondary education in the early part of 20th century.⁵⁷ In addition, Kerala has always put important emphasis on the education of females.

Kerala also made an early commitment to widespread health services for its people. The state created, for example, an extensive network of primary healthcare centers. This provided its citizens, throughout the state, with access to free basic health care and free family planning services. This was coupled with programs to promote exclusive breastfeeding and the improved nutrition of infants, children, and pregnant women. The central government supported the family planning program, the maternal and child health program, and the universal immunization program in all of India, but they were implemented far more effectively and efficiently in Kerala than in other states of India.⁵⁸

The place of women in Kerala society also contributed to the uptake of education by females and improvements throughout Kerala in nutrition and health status. The role of women in many communities in Kerala differs from the roles ascribed to women in many other parts of India. In much of the rest of India, especially in parts of North India, women are regarded by families as liabilities rather than as assets. In most of India, this is partly represented in cultural terms by the fact that the family of a bride must pay a dowry to the family of the groom. In Kerala, however, women have been culturally different: for over a century, they have been seen culturally much more as assets to families and they could inherit and own land, giving them a financial independence and power which was unrivaled among women elsewhere in India.⁵⁹

It is also important to note that Kerala has historically been run by a government that has traditionally placed a premium on community mobilization on important social issues, such as education, greater empowerment of women, health, nutrition, and land reform. Many of these efforts were carried out in ways that raised social awareness about health and nutrition. In 1989, Kerala launched a total literacy campaign, for example, and by the start of the World Literacy

Year in 1990, Ernakulam district in Kerala was declared India's first totally literate district.⁶⁰

Given widespread education in Kerala and the place of women in society, it is not surprising that Kerala went through the demographic transition quite early and well before other places in India. Women with more education are more likely to work and marry later and thus have wider choice in economic and social pursuits. They also have a better knowledge of and easier access to family planning methods and lower fertility than do women with less education.⁶¹

The Impact

What were the impacts on health status of the emphasis that Kerala placed on education, health, nutrition, and the empowerment of women? Although it is not possible to scientifically indicate which policy contributed what share of better health, we can say that for many years the people of Kerala have enjoyed the best educational attainment of any group within India. In the last census, the literacy rates of people aged 7 years and above for India were about 65% on average, with about 76% for males and 54% for females. Kerala, however, had the highest literacy rate in the country, with about 91% overall and about 94% for males and 88% for females.⁶² Kerala also boasts one of the highest newspaper readerships in the world, another feature that promotes the value of women, education, nutrition, and health. It also helps to raise political awareness and the demands of people for participation in and solutions to their concerns, such as education, health, and water.

Linked with this high level of education, especially of women and the promotion of nutrition and health, infant mortality in Kerala in 2001 was 14 per 1000, compared with 91 per 1000 for low-income countries generally and 68 per 1000 on average for India.⁶³ In India, about 2.1 million child deaths occur every year, which is the highest number within a single country worldwide.⁶⁴ The national under-five mortality rate is around 87 per 1000 live births with a wide variation between states. In Kerala, however, the mortality of children under five years is the best in India with an impressive rate of only 19 such deaths per 1000 births in 1998–1999.⁶⁵ In addition, maternal deaths in Kerala are much less common, at 87 per 100,000, than the Indian average of 407 per 100,000.⁶⁶ This partly reflects the extent to which deliveries take place in hospitals in Kerala. Indeed, Kerala's health care system garnered international acclaim when UNICEF and WHO designated it as the world's first "baby-friendly state."⁶⁷ This was in recognition of the fact that more than 95% of Kerala's births are hospital-delivered.⁶⁸

Given these high health indicators, it is not surprising that nutritional status in Kerala is also much better than the Indian average, with 27% of the children younger than five years in Kerala being underweight, compared to the Indian average of 47%. Finally, one should note that life expectancy for men and women in Kerala is about the same at 73 years. This is closer to many developed countries like the United States, which had a life expectancy in 2004 of 78 years, than it is to life expectancy in most low- and middle-income countries.⁶⁹

Lessons Learned

Kerala has long been cited, along with China, Costa Rica, Cuba, and Sri Lanka, as a model of a country or state within a country that has achieved high levels of education and health for its people, before achieving high levels of income. It appears that Kerala has achieved these impacts by politically supporting widespread access to education, nutrition, and health; mobilizing communities around the importance of these areas and of women's empowerment; and investing in low cost but high yielding areas of education, nutrition, and health. In a manner much like Sri Lanka, Kerala has also managed to achieve high levels of health status at relatively low cost.

Have the high levels of health and education in Kerala, however, been associated with high levels of growth of income in the state? The answer to that question is no. The annual per capita Gross Domestic Product (GDP) for the state in year 2001 was \$469. This was close to the Indian average of \$460.⁷⁰ It appears that the economic policies held by the state government over time in Kerala have not yielded high rates of economic growth or produced an environment in which domestic and foreign investors were prepared to work. Rather, the overall income of the state remains quite dependent on the money that workers from Kerala living abroad, especially in the Middle East, send back to their families in Kerala.⁷¹

What then are the messages to take away from Kerala in terms of the link between health and development? First, it is possible, even in the absence of high income, to achieve high levels of health through political commitment, sound investments, and social mobilization. Second, however, in the absence of sound economic policies, the presence of a literate and healthy population alone will not be sufficient to promote rapid economic growth.

MAIN MESSAGES

To understand the most important global health issues, we must be able to understand the determinants of health, how health status is measured, and the meaning of the demographic and epidemiological transitions. There are a number of factors that influence health status. These include genetic makeup, sex, and age. Social and cultural issues and health behaviors are also closely linked to health status. The determinants of health also include education, nutritional status, and socio-economic status. The environment is also a powerful determinant of health, as is access to health services, and the policy approaches that countries take to their health sectors and to investments that could influence the health of their people.

It is also important to understand the most important risk factors that lead to ill health. In the low-income countries on which this book focuses considerable attention, some of the most important risk factors include nutritional status, the lack of safe water or appropriate sanitation, and tobacco smoking. Poor diets that relate to obesity, high blood pressure, high cholesterol, and cardiovascular disease are becoming increasingly important problems as well, even in low-income countries.

There are a number of uses of health data including measuring health status, carrying out disease surveillance, making decisions about investments in health, and assessing the performance of health programs. Those working in health use a common set of indicators to measure health status, including life expectancy, infant and neonatal mortality, under-five child mortality, and the maternal mortality ratio. They also use composite indices, such as DALYs, to measure the burden of disease.

Poorer countries have a relatively larger burden of disease from communicable diseases than from non-communicable diseases, compared to richer countries. As these poorer countries develop, fertility and mortality will decline, the population will age, and the burden of disease will shift toward the non-communicable diseases. These phenomena occur as countries go through what are referred to as the demographic transition and the epidemiological transition.

Life expectancy has improved in all regions of the world since 1990, except in Europe, Central Asia, and Sub-Saharan Africa. The leading cause of death worldwide has now become cardiovascular disease. However, communicable diseases remain relatively much more important in South Asia and Sub-Saharan Africa than in the rest of the world.



Study Questions

1. What are the main factors that determine your health?
2. What are the main factors that would determine the health of a poor person in a poor country?
3. If you could only pick one indicator to describe the health status of a poor country, which indicator would you use and why?
4. Why is it valuable to have composite indicators like DALYs to measure the burden of disease?
5. What is a HALE and how does it differ from just measuring life expectancy at birth?

6. As countries develop economically, what are the most important changes that occur in their burden of disease?
7. Why do these changes occur?
8. In your own country, what population groups have the best health indicators and why?
9. In your country, what population groups have the worst health status and why?
10. How would the population pyramid of Italy differ from that of Nigeria and why?

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Health, Education, Poverty, and the Economy

CHAPTER 3

LEARNING OBJECTIVES

By the end of this chapter the reader will be able to:

- Describe the links between health and education
- Discuss the connections between health, productivity, and earnings
- Describe key relationships between health, the costs of illness, and the impact of health expenditure on poverty
- Discuss some connections between health and equity
- Describe some relationships between expenditure on health and health outcomes
- Differentiate between public and private expenditures on health
- Understand the use of cost-effectiveness analysis as one tool for making investment choices in health
- Discuss the two-way relationship between health and development.

VIGNETTES

Savitha lived in a poor village in north India. When she first became sick, she visited an unlicensed “doctor.” She did not recover and then went to a practitioner of Indian Systems of Medicine. After another two weeks of illness, she went to the outpatient clinic of the main hospital. By the time Savitha had begun to recover, she had spent \$20 equivalent on health services and on the transport to get to them. She had also missed two weeks of work, during which she lost another \$20 of income. The total cost of this illness was about 10% of Savitha’s annual earnings.

Mohammed was in first grade in a small town in northern Nigeria. Mohammed’s family was poor. Mohammed was very small for his age, was very thin, and got sick more often than most children. Because of his poor health, Mohammed

was unable to attend school regularly and was forced to quit school after only 1 year. Unfortunately, he could not read or write, had little knowledge of how to work with figures, and was most likely destined for a life of limited job prospects at very low pay.

Birte was born in Denmark to a middle class family. She was exclusively breastfed until she was six months old, when appropriate complementary foods were introduced. Her family took her regularly for “well baby” check-ups and she received all of her scheduled childhood immunizations. Her hearing and her eyesight were checked before she enrolled in school. Birte attended school regularly, she was attentive in class, and she performed well there. She was able to complete high school and medical school and today is a physician.

ABC company was looking for investments in forest products and examined in detail the possibility of investing in Africa. After carefully considering the potential costs and returns to such an investment, the company decided, however, not to invest in Africa but to invest instead in Asia. In the end, the company believed that they were unlikely to make an acceptable profit on any business in Africa because so many of their workers would be infected with HIV and malaria.

INTRODUCTION

Health and economic matters are intimately linked in a number of ways. First, health is an important contributor to people’s ability to be productive and to accumulate the knowledge and skills they need to be productive, known as “human capital.” Second, health status is also a major determinant of one’s enrollment in and success in school,